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Indian Standard

PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART 7 MOULD GROWTH TEST

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PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART 7 MOULD GROWTH TEST

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Indian Standard

PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART 7 MOULD GROWTH TEST

0. FOREWORD

0.1 This Indian Standard (Part 7) was adopted by the Indian Standards Institution on 28 September 1983, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Fast development in the field of instruments has brought a significant change in their basic content and design. It has been felt over the years that IS : 2352-1963* does not cater for the present day needs of the instruments and is also not in line with the recent trends in climatic and environmental testing procedures to be adopted for improving their quality and reliability. It has, therefore, become necessary to have uniform and more rational testing procedures as far as possible. This series of standards on climatic and durability tests (IS : 10236) has been prepared with this objective.

0.2.1 It is proposed to withdraw the existing Indian Standard (IS : 2352-1963*) as soon as the tests mentioned therein are covered in this new series of IS : 10236.

1. SCOPE

1.1 This standard (Part 7) covers the procedure for conducting mould growth test for optical instruments.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 10236 (Part 1)† shall apply.

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*Procedure for basic climatic and durability tests for optical instruments.

†Procedure for basic climatic and durability tests for optical instruments: Part 1 General (*under preparation*).

3. OBJECT

3.1 The object of this test is to determine the ability of optical instruments to resist mould growth and to assess the effect of such growth on the performance of the instruments.

4. INITIAL MEASUREMENTS

4.1 The instrument shall be visually examined and optically, electrically and mechanically checked as required by the relevant instrument specification.

NOTE — The instrument shall not receive any optical cleaning treatment before test and will be in the condition as supplied by the manufacturer. However, normal cleaning with ethanol or water containing a detergent may be permitted before testing so that mould growth caused by handling can be distinguished from that due to design and workmanship shortcomings.

5. TEST CHAMBER

5.1 The chamber used for this test shall meet the requirements given in **5.2** to **5.7**.

5 2 The chamber shall be capable of maintaining its working space at a temperature of 29 ± 1°C.

5.3 Any periodic cycling of temperature due to the action of the thermostat shall not exceed 1°C per hour.

5.4 The relative humidity inside the chamber shall be maintained at a value greater than 95 percent by exposing a large area of the chamber to a water slurry of potassium sulphate ($K_2 SO_4$). The use of a salt solution reduces the problem of undue condensation on the walls of the chamber which tends to be excessive when pure water is used. Such solution shall be free of impurities as traces of grease or oil reduce the relative humidity to a large extent.

5.5 The chamber shall have a well sealed door to prevent exchange of atmosphere between the interior of the oven and outside.

5.6 The chamber shall have no aided circulation of air within it. However, some gentle circulation may be permitted to attain uniform conditions of temperature and humidity within its working space.

5.7 The door of the chamber shall be opened for a few minutes, once a week, to renew the oxygen supply within it and to add further water to the slurry.

NOTE — If the chamber becomes contaminated, it is desirable to clean it. The preferred method is to heat it to a temperature of 120°C in a moisture saturated atmosphere for one hour. An alternative method is to dry the chamber and fumigate it with propylene oxide; finally washing with water containing a detergent and ventilating it well to remove all oxide fumes.

6. CULTURES

6.1 The following cultures shall be used for this test. All the spores shall be used together whatever the nature of the equipment. Type of attack to be expected from each culture is given below for guidance:

	Culture	*Strain*	*Type of Attack*
a)	*Aspergillus niger*	V. Tieghem	Grows profusely on many materials and is resistant to copper salts
b)	*Aspergillus terreus*	Thom	Attacks plastics
c)	*Aureobasidium pullulans*	(De Barry) Arnaud	Attacks paints and lacquers
d)	*Paecilomyces varioti*	Bainier	Attacks plastics and leather
e)	*Penicillium funiculosum*	Thom	Attacks many materials especially textiles
f)	*Penicillum ochrochloron*	Biourge	Resistant to copper salts; Attacks plastics and textiles
g)	*Scopulariopsis brevicaulis*	(Sacc.) Bain Var. Glabra Thom	Attacks rubber
h)	*Trichoderma viride*	Pers, ex Fr	Attacks cellulose textiles and plastics

6.2 The cultures shall be obtained from an official mould research station.

NOTE — The users and testing organisations can obtain the information about such stations in India from the ISI Directorate General.

6.3 Owing to the large number of generations in the genetic history of the standard cultures, it is possible for them to suffer variation in their ability to attack certain materials. The assessment of their ability requires a high degree of mycological skill and the research station supplying these cultures should ensure that they are as suitable for the test purpose as those supplied previously and considered acceptable. The person responsible for test may ensure this aspect from research station.

6.4 The cultures shall be supplied as spores, on an agar medium in glass containers with cotton plugs loose to allow access of air and moisture and shall be stored in a refrigerator at a temperature between 5°C and 10°C.

6.5 The cultures shall be used for preparing the test suspension when they are between 14 and 21 days old. In exceptional circumstances cultures up to 28 days old may be used.

6.6 The cotton plugs shall not be removed until the mould suspension is about to be made; only one suspension shall be made from the opened container. A fresh, unopened container, shall be used for each batch of suspension made.

7. PREPARATION OF SPORE SUSPENSION

7.1 The spore suspension shall be prepared in distilled water to which has been added 0·05 percent of a non-fungicidal wetting agent. An agent based on *N*-methyltauride (Igepon) or on dioctyl sodium sulphosuccinate has been found to be suitable.

7.2 Ten millilitres (10 ml) of water and the required wetting agent are added gently to each phial or tube containing the cultures. A platinum or nichrome wire is sterilized by heating it to red hot state in a flame and allowed to cool. This wire shall be used to scrap gently the surface of the culture to liberate the spores. The liquid shall be gently agitated to disperse the spores without detaching mycelial fragments and the mould suspension shall then be gently decanted into a flask.

7.3 All the eight dispersions are shaken vigorously together in the flask to mix thoroughly and to break up any lumps of spores.

7.4 The suspension shall be used on the same day on which it is prepared and shall not be stored for future use.

8. CONTROL STRIPS

8.1 The control strips required for the test shall consist of strips of pure white filter paper.

8.2 The nutrient salts solution required for the preparation of control strips shall consist of a solution of the following chemically pure materials in distilled water:

Modified Czapek-Dox Solution Containing Sucrose	*Quantity per Litre*
Potassium dihydrogen orthophosphate (KH_2PO_4)	0·7 g
Potassium monohydrogen ortho-phosphate (K_2HPO_4)	0·3 g
Magnesium sulphate ($MgSO_4 . 7H_2O$)	0·5 g
Sodium nitrate ($NaNO_3$)	2·0 g
Potassium chloride (KCl)	0·5 g
Ferrous sulphate ($FeSO_4 . 7H_2O$)	0·01 g
Sucrose	30·0 g

NOTE — This nutrient salts solution shall be sterilized in an autoclave at a pressure of about 1 bar for 15 minutes. The strip should also be sterilized in a similar fashion.

8.3 The control strips shall be placed in a small glass dish and covered with the nutrient salts solution. The strips shall be removed from the solution and allowed to drain free of drips immediately before use.

8.4 The strips shall be freshly prepared on the day on which they are to be used for the test.

8.5 A freshly prepared solution of nutrient salts shall be used for preparing each batch of control strips.

9. TEST SEVERITY

9.1 Expose the instrument under test for 28 days at 29 ±1°C and at RH more than 95 percent.

10. TEST PROCEDURE

10.1 The relevant specification shall prescribe whether only a visual examination of mould growth is required or whether the exposure is to be followed by performance checks to determine deterioration resulting from mould growth.

10.1.1 The instrument and three control strips shall be sprayed with the mixed spore suspension prepared as in **7**. The spray shall be generated by a nozzle not to be blocked by the fragments of mycelium, such as an artist's spray gun and shall impinge on all exposed surfaces of the sample.

10.1.2 Within 15 minutes of spraying, the instrument and the control strips shall be introduced into the chamber whose working space is maintained at a temperature of 29 ± 1°C and a relative humidity of not less than 95 percent.

10.1.3 The instrument and the control strips shall not be unduly disturbed except for opening the chamber door each week to renew the oxygen supply within it until the completion of the exposure period.

10.1.4 If no mould growth is visible on any one of the control strips when chamber door is opened for the first time after seven days of starting the test, the test shall be considered void and shall be taken up afresh.

10.1.5 Provided that mould growth on the control strips indicates that conditions are suitable and the moulds viable, the sample shall be exposed continuously for 28 days.

10.1.6 The instrument shall be removed from the chamber after 28 days of exposure and examined visually both inside and outside and where possible with the help of 10× magnifier. Such examination shall be done immediately after its removal from the chamber as the mould growth begins to dry and changes in appearance rapidly when exposed to laboratory conditions.

10.1.7 Unless otherwise specified there shall be no mould growth when examined as in **10.1.6**.

NOTE — It is the practice in the manufacture of some of the items to coat the equipment with a varnish containing a fungicide. This gives only temporary protection against mould growth. Such fungicides are normally volatile substances and while some will give extreme protection for a few months, others will give fair protection for one or more years. The period of protection will be shorter if the article operates at high temperature than if it is always cool. Even where the fungicides give prolonged protection there is a tendency for evolutionary variation to produce, in time, a selection of moulds which are resistant to the fungicide. Hence, where instruments are expected to function for several years in conditions of continual exposure to mould spores and where humidity is high enough to give prolific growth the test shall be carried out on an instrument coated with a varnish identical with that used except that it contains no fungicide.

10.2 Recovery — After examination the instrument shall be allowed to remain under standard atmospheric conditions for recovery for not less than one hour and not more than two hours.

11. FINAL MEASUREMENTS

11.1 After recovery the instrument shall be checked for performance in accordance with the relevant instrument specification.

12. DETAILS TO BE GIVEN IN RELEVANT INSTRUMENT SPECIFICATION

12.1 When this test is included in the relevant instrument specification, the following details shall be given:

a) Initial observations/measurements;
b) Whether normal cleaning is permitted before conditioning;
c) Whether only visual examination is required or functional checking is also required;
d) The allowable extent of mould growth if other than that specified in **10.1.6**;
e) Whether testing with an instrument coated with identical varnish without fungicide is required in place of instrument coated with varnish containing a fungicide;
f) Final observations/measurements; and
g) Any deviation from the normal procedure.